REMARKS

The following remarks are responsive to the March 3, 2006 Office Action for the above-identified patent application. This Office Action is based on Claims 18, 19, and 56-66, which are presently pending.

Rejection Under 35 U.S.C. § 102(e) Based on Inaba, et al. (U.S. 6,738,549)

Claims 18 and 19 are rejected under 35 U.S.C. § 102(e) as being anticipated by Inaba, et al. ("Inaba"). Applicants respectfully submit that Inaba does not teach or suggest each of the claimed features recited in Claims 18 and 19.

For example, Claim 18 recites:

> A polarization maintaining air-clad fiber, where polarization maintaining operation of said fiber is obtained by the incorporation of stress producing regions into said fiber.

The Examiner states that Inaba discloses a polarization maintaining fiber comprising, among other things, "air cladding", which the Examiner characterizes as "the air that surrounds the fiber." However, this reference does not teach or suggest that any of the disclosed optical fibers are surrounded by air. For example, Inaba does not explicitly refer to air or air cladding surrounding any of the optical fibers described in the reference. Additionally, the space surrounding the optical fibers illustrated in FIGS. 1 and 5 is not called out by a reference numeral or any other indicia identifying the space as air or air cladding.

It is conventional to surround optical fibers with a jacket or coating, for example, to strengthen the fiber, to protect the surface of the fiber from deterioration, and/or to reduce the environmental sensitivity of the light-guiding properties of the fiber. In fact, uncoated optical fibers experience significant radiation losses, especially in regions where the fiber is bent. Since the jacket or coating do not contribute to the optical waveguide properties of the fiber, it is conventional not to illustrate the jacket or coating in drawings or figures such as, for example, FIGS. 1 and 5 in Inaba. Additionally, Inaba teaches a polarization maintaining optical fiber perform from which an optical fiber is produced by melting and drawing (see, e.g., column 3, lines 3-26). Optical fibers generally are coated after the melting and drawing process (see, e.g., "Fiber Optic Communications" by Joseph C. Palais, Prentice Hall, 1992, pp. 126-130);

accordingly, Inaba would have no motivation to teach or suggest fiber coating methods, which are conventional and well known in the art.

Since Inaba does not teach or suggest, for example, an air-clad fiber, Applicants respectfully submit that Claim 18 is patentably distinguished over Inaba. Claim 19 depends from Claim 18 and includes the limitations of Claim 18 in combination with additional limitations. Applicants respectfully submit, for at least the reasons above, that the combination of limitations in Claim 19 is also not taught or suggested by Inaba.

Applicants respectfully request allowance of Claims 18 and 19.

Rejection Under 35 U.S.C. § 102(b) Based on Berkey (U.S. 5,307,436)

Claim 56 is rejected under 35 U.S.C. § 102(b) as being anticipated by Berkey. Applicants respectfully submit that Berkey does not teach or suggest each of the claimed features recited in Claim 56.

Claim 56 recites a polarization maintaining fiber, comprising

> a fiber core having a diameter > 15μm; a first cladding surrounding said core; and further including stress-producing regions incorporated therein; an air cladding at least substantially surrounding said first cladding; and a third cladding surrounding said air cladding.

The Examiner states that Berkey discloses, among other things, "a first cladding surrounding the core (6) and further including stress producing regions therein." The Examiner characterizes stress producing regions as being "an inherent property of [core member 6's] asymmetrical shape."

Applicants respectfully disagree with the Examiner's characterization of Berkey. There are two main ways to induce birefringence in manufacturing a polarization maintaining optical fiber: "shape" birefringence (also known as "form" birefringence) and "stress-induced" birefringence (see, e.g., "Polarization of Light," by Serge Huard, translated by Gianni Vacca, John Wiley & Sons, 1997, pp. 273-276). Shape birefringence relies on anisotropies in the geometrical shape of the core (e.g., an ellipticity) to produce birefringence. Stress-induced birefringence relies on using materials exhibiting different thermal expansion coefficients to induce asymmetrical elastic stresses on the fiber core in order to produce asymmetrical refractive indexes by the photoelastic effect.

Applicants respectfully disagree with the Examiner's assertion that shape asymmetries inherently generate sufficient asymmetrical elastic stresses on the core to produce polarization maintaining fibers. Applicants respectfully submit that the asymmetrical shapes of the core members of Berkey's fibers (see FIGS. 1-4) produce polarization maintaining waveguides via shape birefringence rather than stress-induced birefringence. For example, Berkey characterizes his invention as being "distinct" (col. 2, line 4) from prior art patents in which a stress field (produced by, e.g., "relative thermal expansion coefficients") defines a refractive index gradient that establishes a polarization maintaining feature of a waveguide (see, col. 2, lines 20-40). Also, Berkey characterizes preferred embodiments of polarization maintaining waveguides as having core member shapes that are "elliptical" (see, e.g., Figs. 3-4; col. 6, lines 44-45 and 58; col. 8, lines 11-14). Elliptical cores are a well-known example of shape birefringence (see, e.g., "Polarization of Light," by Serge Huard, cited above).

Indeed, Berkey teaches away from using stress induced birefringence to produce polarization maintaining fibers. Berkey teaches, for example, that substantial isolation of the core member "*prevents* stress induced birefringence in the core member…" (col. 6, lines 49-52; emphasis added). Accordingly, Applicants respectfully disagree with the Examiner's characterization of Berkey as teaching or suggesting that stress-producing regions are an "inherent property" of a core's asymmetrical shape. The Examiner's characterization is not common knowledge within the fiber optic arts and, moreover, is not capable of instant and unquestionable demonstration as being well-known. Accordingly, Applicants respectfully request the Examiner to provide citations to prior art references in support of the Examiner's characterization (see M.P.E.P. 2144.03).

Accordingly, Berkey does not teach or suggest, for example, a first cladding surrounding said core and further including stress-producing regions incorporated therein, in combination with the other limitations of Claim 56. Applicants respectfully submit that Claim 56 is patentably distinguished over Berkey, and Applicants respectfully request allowance of Claim 56.

Rejection Under 35 U.S.C. § 102(e) Based on Kawanishi, et al. (U.S. 6,788,865)

Claims 57-66 are rejected under 35 U.S.C. § 102(e) as being anticipated by Kawanishi, et al. ("Kawanishi"). Applicants respectfully submit that Kawanishi does not teach or suggest each of the claimed features recited in Claims 57-66.

For example, Claim 57 recites a polarization maintaining optical fiber comprising

> a fiber core; a cladding region disposed about said core, said cladding region comprising a plurality of features disposed therein, said plurality of features forming an optical cladding for said core; and a plurality of stress producing regions that induce birefringence in said fiber thereby producing polarization maintaining operation.

The Examiner states that regions "b and c" (presumably in reference to portions 72b and 72c of the photonic crystal structure cladding 72 shown in Kawanishi's FIG. 8) are stress producing regions in the cladding region.

Applicants respectfully disagree with the Examiner's characterization of portions 72b and 72c as being stress producing regions. For reasons similar to those described above with reference to Berkey, Applicants submit that Kawanishi produces polarization maintaining optical fibers via shape birefringence rather than stress-induced birefringence. Applicants note that Kawanishi's photonic crystal structure cladding 72 has an asymmetric, triangular shaped diffraction grating arrangement, and that the lattice holes in portions 72b and 72c have the same lattice interval but different diameters, thereby producing additional asymmetry in the fiber's shape (see, e.g., col. 7, lines 46-58).

Moreover, Kawanishi teaches away from the use of stress applying materials in the fabrication of polarization maintaining fibers. For example, Kawanishi distinguishes his invention from the PANDA fiber, which, as is well-known, includes stress applying portions that generate stress-induced birefringence (see, col. 3, lines 12-31).

Accordingly, Kawanishi does not teach or suggest, for example, a plurality of stress producing regions that induce birefringence in said fiber thereby producing polarization maintaining operation. Applicants respectfully submit that Claim 57 is patentably distinguished over Kawanishi, and Applicants respectfully request allowance of Claim 57.

The Examiner states that Claims 58-61 read on the properties disclosed for region 72. However, Claims 58-61 depend from Claim 57 and include the limitations of Claim 57 in combination with additional limitations. Applicants respectfully submit, for at least the reasons above, that the combination of limitations in Claims 58-61 is also not taught or suggested by Inaba. Accordingly, Applicants submit that Claims 58-61 are patentably distinguished over Kawanishi, and Applicants respectfully request allowance of Claims 58-61.

The Examiner states that Claims 62-66 read on the structure applied to Claims 57-61.

Claim 62, for example, recites a polarization maintaining optical fiber comprising

> a fiber core; a plurality of regions disposed about said core, said regions forming an optical cladding for said core; and a plurality of stress producing regions that induce birefringence in said fiber thereby producing polarization maintaining operation.

As discussed above with reference to Claim 57, Kawanishi does not teach or suggest, for example, a plurality of stress producing regions that induce birefringence in said fiber thereby producing polarization maintaining operation. Applicants respectfully submit that Claim 62 is patentably distinguished over Kawanishi, and Applicants respectfully request allowance of Claim 62.

Claims 63-66 depend from Claim 62 and include the limitations of Claim 62 in combination with additional limitations. Applicants respectfully submit, for at least the reasons above, that the combination of limitations in Claims 63-66 is also not taught or suggested by Kawanishi. Accordingly, Applicants submit that Claims 63-66 are patentably distinguished over Kawanishi, and Applicants respectfully request allowance of Claims 63-66.

Summary

For at least the foregoing reasons, Applicants respectfully submit that pending Claims 18, 19, and 56-66 are in condition for allowance and respectfully request that a Notice of Allowance be issued at the earliest opportunity.

Request for Telephone Interview

Should there be any questions or issues that may be resolved by a telephone interview, Applicant respectfully invites the Examiner to call the undersigned attorney of record at the telephone number listed below.

Please charge any additional fees, including any fees for additional extension of time, or credit overpayment to Deposit Account No. 11-1410.

Respectfully submitted,

KNOBBE, MARTENS, OLSON & BEAR, LLP

Dated: 6/30/06

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